

CLAIMS

1. A submerged sample observation apparatus comprising:

5 a scanning probe microscope including a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light reflected from the cantilever;

10 a sample container having a side wall for holding a liquid therein; and

means arranged on the surface of the liquid for preventing volatilization of the liquid;

15 wherein the probe is brought in closely opposed relation to a sample in the liquid in the sample container, the relative positions of a probe and a sample are changed and, based on the interaction between the probe and the sample, a surface image of the sample is produced thereby to observe the sample.

20 2. A submerged sample observation apparatus according to claim 1, wherein said means for preventing volatilization of said liquid is a layer of a sealing liquid formed on the surface of said liquid, said sealing liquid having a lower specific gravity than said first liquid and not mixed with said first liquid.

25 3. A submerged sample observation apparatus according to claim 1, wherein said means for preventing volatilization of said liquid is a layer of an oil formed on the surface of said liquid.

30 4. A submerged sample observation apparatus according to claim 1, wherein said means for preventing volatilization of said liquid is a Langmuir-Blodgett film formed on the surface of said liquid.

35 5. A submerged sample observation apparatus according to claim 1, wherein said means for preventing volatilization of said liquid is a resin film formed on the surface of said liquid.

6. A submerged sample observation apparatus

comprising:

5           a scanning probe microscope including a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light reflected from the cantilever; and

10           a sample container having a side wall for holding a liquid therein;

15           wherein the probe is brought in closely opposed relation to a sample in the liquid in the sample container, the relative positions of a probe and a sample are changed and, based on the interaction between the probe and the sample, a surface image of the sample is produced thereby to observe the sample, and

20           wherein an insulative liquid layer not mixed with the liquid having the sample submerged therein is formed on the surface of the liquid, and only the forward end portion of the probe is introduced into the liquid having the sample submerged therein, while the remaining portion of the probe is covered by the insulative liquid layer.

25           7. A submerged sample observation apparatus according to claim 6, wherein said insulative liquid is an insulative oil.

30           8. A submerged sample observation apparatus comprising:

35           a scanning probe microscope including a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light reflected from the cantilever; and

              a sample container having a side wall for holding a liquid therein;

40           wherein the probe is brought in closely opposed relation to a sample in the liquid in the sample container, the relative positions of a probe and a sample are changed and, based on the interaction between the

probe and the sample, a surface image of the sample is produced thereby to observe the sample, and

wherein the light from the light source is applied to the cantilever in the liquid without passing through the interface between the atmosphere and the liquid having the sample submerged therein, and the reflected light is picked up in the liquid.

9. A submerged sample observation apparatus according to claim 8, wherein said light source and said detector are arranged in said liquid.

10. A submerged sample observation apparatus according to claim 8, wherein the light from said light source is applied from an optic fiber to said cantilever, and the light reflected from said cantilever is picked up by said optic fiber arranged in said liquid.

11. A method of observing a sample submerged in a liquid using a scanning probe microscope comprising a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light reflected from the cantilever;

wherein the probe is brought in closely opposed relation to a sample in the liquid in a sample container, the relative positions of the probe and the sample are changed and, based on the interaction between the probe and the sample, a surface image of the sample is produced thereby to observe the sample, and

wherein means for preventing volatilization of the liquid is arranged on the surface of the liquid.

12. A method of observing a sample submerged in a liquid according to claim 11, wherein said means for preventing volatilization of said liquid is a layer of a sealing liquid formed on the surface of said liquid, said sealing liquid having a lower specific gravity than said first liquid and not mixed with said first liquid.

13. A method of observing a sample submerged in a

liquid according to claim 11, wherein said means for preventing volatilization of said liquid is a layer of an oil formed on the surface of said liquid.

5       14. A method of observing a sample submerged in a liquid according to claim 11, wherein said means for preventing volatilization of said liquid is a Langmuir-Blodgett film formed on the surface of said liquid.

10      15. A method of observing a sample submerged in a liquid according to claim 11, wherein said means for preventing volatilization of said liquid is a resin film formed on the surface of said liquid.

15      16. A method of observing a sample submerged in a liquid using a scanning probe microscope comprising a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light reflected from the cantilever;

20      wherein the probe is brought in closely opposed relation to the sample in the liquid in the sample container, the relative positions of the probe and the sample are changed and, based on the interaction between the probe and the sample, a surface image of the sample is produced thereby to observe the sample, and

25      wherein an insulative liquid layer not mixed with the liquid having the sample submerged therein is formed on the liquid, and only the forward end portion of the probe is placed in the liquid while the remaining portion of the probe is covered by the insulative liquid layer.

30      17. A method of observing a sample submerged in a liquid according to claim 16, wherein said insulative liquid is an insulative oil.

35      18. A method of observing a sample submerged in a liquid using a scanning probe microscope comprising a cantilever having a probe arranged at the forward end thereof, a light source for applying light on the cantilever and a detector for detecting the light

reflected from the cantilever;

5 wherein the probe is brought into closely opposed relation to the sample in the liquid in a sample container, the relative positions of the probe and the sample are changed and, based on the interaction between the probe and the sample, a surface image of the sample is produced thereby to observe the sample, and

10 wherein the light from the light source is applied to the cantilever in the liquid without passing through the interface between the atmosphere and the liquid having the sample submerged therein, and the reflected light is picked up in the liquid.

15 19. A method of observing a sample submerged in a liquid according to claim 18, wherein said light source and said detector are arranged in said liquid.

20 20. A method of observing a sample submerged in a liquid according to claim 18, wherein the light from said light source is applied from an optic fiber inserted in said liquid to said cantilever and the light reflected from said cantilever is picked up by said optic fiber.